

Ovary Sparing Spay in Canines: An Alternative to Traditional Ovariohysterectomy

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Veterinary medicine has advanced and continues to do so based on research, improved medical techniques and supplies, owner involvement and societal roles of the animal. New and creative ideas drive the research field that helps to shape the practitioner's role in veterinary medicine and fuels the desire for owners to provide better lives for their pets. A topic that has soared in interest in the last several years is pet sterilization. Traditional thoughts preached by the veterinary industry has been spay and neuter to reduce the pet population. While this is a valid statement, veterinary medicine has grown to focus on individual patient health while keeping the population as a whole in mind. This has pushed interested researchers to look at the potential outcomes of sterilization on companion animals in regards to lifelong health.

Traditional spaying and neutering is a relatively simple surgery that veterinary students learn as a primary surgical procedure during veterinary school and it is a surgery that is used widely by the veterinary industry. Pet overpopulation continues to be a major concern, which gives traditional spaying and neutering a prime role in the veterinary world. However, these traditional sterilization procedures are accompanied by risks as well as benefits. Removing gonads, either at an early age or later in life, places possible short and long-term implications upon the individual animal. Alternative procedures that have been used in practice include vasectomy, ovariectomy, vaccination, ovary sparing spay or simply leaving the animal intact.

Recent research regarding the possible negative side effects of gonad removal has been centered on large to giant breed dogs. Given their mature size, the musculoskeletal system is placed under tremendous stress during growth which can be negatively impacted by the removal of gonads early in life. While these associations have been well documented, more information is

being collected regarding other possible detriments of gonad removal in large breed dogs. A retrospective study completed at the University of California Davis on a population of Golden Retrievers monitored for prevalence of different types of neoplasia and joint disease in subpopulations based upon gonad status. Data was collected on 759 male and female dogs that were either intact or sterilized and between 1-8 years of age. The animals were further classified as intact, neutered early (less than 12 months of age) or neutered late (greater than 12 months of age). The study focused on the prevalence of diseases including hip dysplasia, cranial cruciate ligament disease, lymphosarcoma, hemangiosarcoma and mast cell tumor with reported outcomes significant at $p < 0.5$. Results between neutered and intact animals were considered significant with a consistent overrepresentation of all diseases in the neutered groups compared to intact animals (Torres de la Riva, 2013). Findings included no evidence of cranial cruciate disease in the male and female intact groups and no diagnosis of mast cell tumor in the intact female groups. While information can be extrapolated from the statistical findings, care should be taken due to the nature of the study being retrospective and based upon a hospital population of animals. Another retrospective study that was completed similarly to Torres de la Riva's was one done by Benjamin Hart on Golden Retrievers and Labrador Retrievers, also at University of California Davis. Results of the study were comparable to the previous, with acknowledgement that a slight difference found in body condition score between neutered and intact animals was inconsistent based on individual lifestyle and thus joint disorders could not be directly correlated with being neutered and overweight (Hart, 2014).

Rottweilers were another large breed of dog that was the focus of a longevity study completed by Waters et al. in 2009. The case study observed records of Rottweilers that lived greater than 13 years of age compared to the average age of 9.4 years. Those that had lived

longer than 13 years of age were thought to be exceptionally long lived for the breed. A strong association was found between remaining intact and living an exceptionally long life. The study found that 35% of average aged dogs had died due to osteosarcoma, compared to less than 8% of the exceptionally aged dogs (Waters, 2009). In addition, dogs with the longest period of ovary exposure had three times the chance of reaching exceptional longevity compared to shortened exposure, specifically if ovaries were left intact for the first seven years of life. This study mirrors a human study completed by Parker et al. in 2009 in which women that received hysterectomies as opposed to ovariectomies had lower mortality, heart disease and cancer incidence (Parker, 2009). While comparisons between species can be difficult or at times not even applicable, this correlation between long-term gonadal hormone exposures in separate species is one to further explore.

Acquired urinary sphincter incontinence, formerly known as estrogen-responsive urinary incontinence, is a common complaint of owners with middle aged to older female dogs. Previous terminology of the syndrome is due to its positive medical response to estrogen therapy. One theory is that when a female is spayed, there is a decrease in circulating estrogen leading to an up-regulation of luteinizing hormone (LH) receptors along the urinary tract (Zwinda, 2016). When these animals are treated with estrogens, phenylpropanolamine, prolonged GnRH or with GnRH immunization, urinary continence is often restored. Although statistical data varies in terms of urinary incontinence and spayed females at 2-20%, recent data has shown a strong association between early age spaying and dogs that are greater than 30 pounds with urinary incontinence (Forsee, 2013). Time of ovariohysterectomy has also been a topic of concern in regards to development of urinary incontinence. However, a case control study completed by de Bleser et al. in 2009 indicated that the age of gonadectomy was independent of development of

urinary incontinence (de Bleser, 2009). This particular study did not examine the correlation of urinary incontinence and early spaying at less than 3 months of age and only involved comparing animals that were 10 and 6 years of age in each control group. A retrospective cohort study completed by Spain et al. in 2004 revealed that early spaying at less than three months of age was indeed associated with urinary incontinence when compared to animals that were spayed later than three months of age (Spain, 2004).

Reasons for spaying or neutering dogs is often related to removing the possibility of undesirable behavioral characteristics in intact pets such as marking, mounting or inappropriate urination. However, this myth has been re-evaluated and revealed that the studies often quoted for examining behavior and gonadectomy did not use proper control groups and that statistical differences in behavior after gonadectomy in relation to mounting and urine marking were not significant (Zink, 2014). A retrospective cohort study on a population of Vizslas was performed which compared groups of gonadectomized and intact Vizslas over a span of 16 years. Groups were based on age of gonadectomy including <6 months, 7-12 months, >12 months and sexually intact for both male and females. Results concluded that the overall risk of various behavior disorders such as fear, anxiety, aggression and hypersensitivity were increased after gonadectomy in Vizslas (Zink, 2014). A smaller scale prospective study was completed by Kim et al. on 14 healthy female German Shepherd Dogs at the Korean Air Force Dog Training Center that ranged in age from 5-10 months and were randomly assigned to gonadectomized or intact population groups. Results of this study revealed an increase in reactivity in the female dogs that received ovariectomies compared to the intact group at approximately 4-5 months after surgery (Kim, 2001). Furthermore, a possible anxiolytic effect of oxytocin that is enhanced by

circulating estrogen has been studied in the mouse which may relate to the previous increase in anxiety and fear-based behaviors noted in gonadectomized females (McCarthy, 1996).

Other associated changes noted in ovariectomized dogs include weight gain or predisposition to obesity, increased appetite with decreased satiety and overall decrease in metabolism. Gonadectomy has been shown to be the largest risk factor associated with obesity with over 50% of gonadectomized animals being overweight or obese (Zwinda, 2016). While spayed females may be predisposed to weight gain, the process is multifactorial and includes components such as lifestyle, breed and exercise habits. A more recent concern that may be associated with gonadectomy is cognitive age related dysfunction. Cognitive age related dysfunction can include behaviors such as disorientation, changes in social behavior, loss of house training and disturbed sleep cycles. Behaviors such as these that are recognized in geriatric dogs can be compared to changes seen in aged human patients with Alzheimer's disease. Benjamin Hart completed a cohort study in 2001 relating the effect gonadectomy on age related cognitive dysfunction in dogs. Unfortunately, there were not enough available intact bitches to compare to spayed females but significant data was gathered on intact male and castrated male dogs between the ages of 11 and 14 years old. Results showed that the group of neutered males did indeed have an increase in cognitive decline associated with age compared to intact male dogs when reexamined for further cognitive impairment 12-18 months after the initial assessment (Hart, 2001). Postulated conclusions included that circulating testosterone is protective against progression of cognitive dysfunction in males, and this theory was extrapolated to the role of estrogen in females. Hart cited a study completed in postmenopausal women taking estrogen replacement in which those women were found to be at lower risk of developing Alzheimer's disease (Asthana, 1991). In addition, postmenopausal women with

current Alzheimer's disease benefited from estrogen therapy in enhancing cognitive function.

Hart also cites numerous studies and literature that suggests that estradiol and estrogen enhances memory, maintains neuronal transmitters in the hippocampus and frontal cortex, and helps reduce beta amyloid deposits that make up the neural plaques associated with cognitive dysfunction (Hart, 2001).

One of the most potent arguments for spaying a bitch is to provide protective measures against mammary gland neoplasia, ovarian neoplasia and pyometra. Mammary gland tumors have an incidence of about 3.4% in female dogs and are one of the most common types of malignant tumors in dogs with 50% malignant and 50% benign overall (Kustritz, 2012). While certain breeds of dogs are more prone to developing mammary gland tumors than others, risk factors that have historically been associated with development of mammary gland tumors, such as a neuter status and age at gonadectomy, may not be entirely accurate. Commonly cited papers that were published in the 1960's and 1970's were brought into question by a literature review performed by Beauvais et al. in 2012. An examination and comparison of study types, statistical data, results and potential bias was compiled. Overall, Beauvais found flaws with each study and potential significant bias and that the strength of evidence suggesting protective benefits of spaying and neutering was weak (Beauvais, 2012). Further prospective research and conclusive evidence is necessary to make associations with hormone exposure and mammary gland neoplasia. If an animal is left intact or has an ovary sparing procedure performed, regular examination of the mammary glands by palpation or ultrasound would be adequate, non-invasive techniques for monitoring for tumor development. Ovarian neoplasia is another tumor type that is commonly implicated in the decision to spay. While ovarian tumors do occur, the incidence of ovarian tumors in dogs is low and metastasis is rare with ovariohysterectomy being curative in

most circumstance (Kustritz, 2012). Pyometra is a concern in intact bitches and the risk of developing an open or closed pyometra increases with age with incidences of 15.4% at 4 years of age and 23-24% at 10 years of age (Kustritz, 2012). Pyometra can be prevented with routine ovariohysterectomy or ovariectomy if all ovarian tissue is removed. However, other sterilization procedures can also be performed to remove the chances of developing a pyometra in bitches while maintaining ovarian tissue and hormone exposure.

Ovary sparing spay procedures are an alternative to traditional ovariohysterectomies by providing protective benefits such as prevention of pyometra and population control while maintaining circulating hormone levels for health issues previously discussed. The ovary sparing spay procedure has been cited and in use since the 1970's and was described as a partial spay procedure by Wendell Belfield in 1972. He noted that a partial spay involving removal of the uterine horns, body of uterus and cervix prevented pregnancy and proestrual blood flow while maintaining hormonal influence with both ovaries. At that time, Belfield also noted that the approach of ovary sparing spay is most valuable in larger breeds and best performed at around 6 months of age for ease of surgery.

The surgical approach to an ovary sparing spay procedure is similar to that of an ovariohysterectomy. A ventral midline incision is made for entrance into the abdominal cavity. The uterine horns and body are visualized and exteriorized with extension of the incision if necessary to properly expose both ovaries. The uterine horns and associated vasculature are carefully ligated. The uterine body is ligated and excised at the level of the cervix with a 3-clamp technique and the broad ligament with vessels is ligated from the uterine artery. A choice may be made to remove the entire cervix and potentially the proximal vagina for extra precaution. Development of stump pyometra is of concern with this procedure due to the possibility of not

removing all endometrial tissue if precaution is not taken at time of surgery. Standard ventral midline closure can be completed similarly to an ovariohysterectomy.

Benefits of performing an ovary sparing spay procedure include preservation of the ovaries and associated hormones, prevention of stump pyometra and similar surgical time and recovery when compared to other surgical sterilization procedures. Based on previously mentioned supporting data, patients that may benefit the most from an ovary sparing spay over a different sterilization procedure include large breed dogs, dogs at risk for orthopedic complications, dogs at risk for certain types of neoplasms or performance animals. The prevention of stump pyometra can be achieved by performing the procedure with accuracy and diligence so that no endometrial tissue is retained. Surgical time and patient recovery improves with clinician experience and compares similarly to timing of an ovariohysterectomy. Possible negative considerations of an ovary sparing spay is that a larger incision is usually necessary, precision of surgical techniques is required, and there is no consensus within the veterinary community on identifying reproductive status either on the animal or on paper. Other potential concerns after surgery include the continuation of estrous cycling without overt discharge and the risk of vaginal rupture if allowed to copulate.

Veterinary medicine is evolving to encompass research that has previously been neglected due to traditional theories and set standards. Preservation of hormones can be as important in our canine patients' quality of life and health as much as other aspects such as regular vaccination and physical exams. It is important to note, however, that not all clients and pets are well suited for sterilization procedures other than standard ovariohysterectomy, and that selection of patients for an ovary sparing spay should be done on an individual basis. The goals of the client, health concerns for the individual pet and the job of the patient should be taken into

account and discussed between the veterinary and client, which further solidifies the veterinary-client relationship. Once a discussion has begun, an individual health plan for the patient can be created for the overall well-being of that animal.

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